

Table 5-1
Summary of Hazard/Risk Estimates and Risk Drivers

Exposure Scenario/ Receptors	Total Hazard/Risk				RME Risk Drivers				
	CT		RME		Arsenic		Iron	Cadmium	Zinc
	HI	CR	HI	CR	HI (Media)	CR (Media)	HI (Media)	HI (Media)	HI (Media)
Lower Basin									
Child residents	1	NC	4	NC	1 (yard soil)	NC	2 (yard soil)	—	—
Child/adult residents	0.4	9E-06	1	1E-04	—	7E-05 (yard soil)	—	—	—
Child neighborhood recreational	0.3	2E-06	1	2E-05	—	1E-05 (soil/sediment)	—	—	—
Child visitors ^a	0.4	NC	2	NC	0.5 (soil/sediment)	NC	0.6 (soil/sediment)	—	—
Child/adult visitors ^a	0.1	3E-06	0.5	3E-05	—	3E-05 (soil/sediment)	—	—	—
Construction workers	0.2	3E-06	2	8E-05	0.5 (subsurface/surface soil)	8E-05 (subsurface/surface soil)	0.7 (subsurface/surface soil)	—	—

^aVisitors refer to public recreational receptors.

^bBased on sediment and surface water in the South Fork for Osburn, Wallace, and Silverton combined.

^cBased on sediment and surface water in the South Fork for Osburn, Wallace, and Silverton combined and surface soil in upland parks and schools in Silverton.

^dBased on sediment and surface water in the South Fork for Osburn, Wallace, and Silverton combined and surface soil in upland parks and schools in Wallace.

^eMidGradSeg01 includes the towns of Osburn, Wallace, and Silverton. Risk and hazard estimates are applicable to construction workers on projects in any of the towns.

^fIndividual pathway not included in the total risk and hazard estimates for the exposure scenarios and receptors. See text discussion.

^gBased on Northern Pike, the species with the highest concentrations.

^hBased on sediment, surface water, and wastepiles.

Notes:

Bold value indicates HI exceeds 1 or CR exceeds 1E-06.

— - not a risk driver

CR - cancer risk CT - central tendency

HI - hazard index NC - not calculated

RME - reasonable maximum exposure

Table 5-1 (Continued)
Summary of Hazard/Risk Estimates and Risk Drivers

Kingston									
Child residents	0.7	NC	2	NC	0.6 (yard soil)	NC	1 (yard soil)	—	—
Child/adult residents	0.2	5E-06	0.7	5E-05	—	4E-05 (yard soil)	—	—	—
Child neighborhood recreational	0.3	2E-06	1	3E-05	—	2E-05 (soil/sediment)	—	—	—
Child visitors ^a	0.4	NC	2	NC	0.7 (soil/sediment)	NC	0.6 (soil/sediment)	—	—
Child/adult visitors ^a	0.1	3E-06	0.6	4E-05	—	4E-05 (soil/sediment)	—	—	—
Construction workers	0.06	9E-07	0.5	3E-05	—	3E-05 (subsurface/surface soil)	—	—	—
Side Gulches									
Child residents	1	NC	6	NC	3 (yard soil/ tap water)	NC	1 (yard soil)	—	—
Child/adult residents	0.5	2E-05	2	3E-04	1 (yard soil/ tap water)	3E-04 (yard soil/ tap water)	0.3 (yard soil)	—	—
Child neighborhood recreational	0.3	1E-06	2	2E-05	0.4 (soil/sediment)	2E-05 (Elk Creek soil/Elk Creek Pond sediment)	—	—	—
Osburn									
Child residents	1	NC	3	NC	1 (yard soil)	NC	1 (yard soil)	—	—
Child/adult residents	0.3	9E-06	0.9	8E-05	—	7E-05 (yard soil)	—	—	—
Child neighborhood recreational ^b	0.07	3E-07	0.3	5E-06	—	5E-06 (sediment)	—	—	—

Table 5-1 (Continued)
Summary of Hazard/Risk Estimates and Risk Drivers

Silverton									
Child residents	0.7	NC	2	NC	0.6 (yard soil)	NC	0.9 (yard soil)	—	—
Child/adult residents	0.2	5E-06	0.7	5E-05	—	3E-05 (yard soil)	—	—	—
Child neighborhood recreational ^c	0.1	5E-07	0.5	9E-06	—	8E-06 (surface soil/sediment)	—		
Child visitors ^a	0.06	NC	0.3	NC	—	NC	—	—	—
Child/adult visitors ^a	0.02	3E-07	0.09	6E-06	—	6E-06 (surface soil)	—	—	—
Wallace									
Child residents	0.9	NC	3	NC	0.6 (yard soil)	NC	0.9 (yard soil)	—	—
Child/adult residents	0.3	6E-06	0.8	5E-05	—	4E-05 (yard soil)	—	—	—
Child neighborhood recreational ^d	0.1	6E-07	0.6	8E-06	—	8E-06 (surface soil/sediment)	—		
Child visitors ^a	0.09	NC	0.5	NC	—	NC	—	—	—
Child/adult visitors ^a	0.03	4E-07	0.1	6E-06	—	6E-06 (surface soil)	—	—	—
MidGradSeg01^e									
Construction workers	0.05	7E-07	0.4	2E-05	—	2E-05 (subsurface/surface soil)	—	—	—
Mullan									
Child residents	1	NC	3	NC	1 (yard soil)	NC	1 (yard soil)	—	—
Child/adult residents	0.3	6E-06	1	7E-05	—	6E-05 (yard soil)	—	—	—
Child neighborhood recreational ^h	0.06	2E-07	0.4	4E-06	—	4E-06 (waste piles/sediment)	—	—	—
Construction workers	0.07	8E-07	0.5	2E-05	—	2E-05 (subsurface/surface soil)	—	—	—

Table 5-1 (Continued)
Summary of Hazard/Risk Estimates and Risk Drivers

Nine Mile									
Child residents	1	NC	3	NC	1 (yard soil)	NC	1 (yard soil)	—	—
Future child residents	10	NC	22	NC	—	NC	—	17 (groundwater)	4 (groundwater)
Child/adult residents	0.3	8E-06	1	8E-05	—	7E-05 (yard soil)	—	—	—
Future child/adult residents	5	3E-06	12	3E-05	—	3E-05 (groundwater)	—	9 (groundwater)	2 (groundwater)
Child neighborhood recreational ^h	0.1	7E-07	1	4E-05	0.7 (waste piles)	3E-05 (waste piles)	—	—	—
Construction workers	0.05	6E-07	0.4	2E-05	—	2E-05 (subsurface/surface soil)	—	—	—
Blackwell Island									
Child visitors ^a	0.1	NC	0.7	NC	—	NC	—	—	—
Child/adult visitors ^a	0.05	1E-06	0.2	1E-05	—	1E-05 (soil/sediment)	—	—	—
Homegrown Vegetables^f									
Child residents	0.1	NC	2	NC	—	NC	—	2	—
Child/adult residents	0.1	2E-06	2	8E-05	—	8.00E-05	—	2	—
Fish^g									
Adult visitors ^a	0.4	NC	0.9	NC	—	NC	—	—	—

Table 5-2
Chemicals With Hazard Indices Greater Than or Equal to 1

Exposure Scenario/Receptors	Chemical	Hazard Index
Lower Basin		
RME residential child	Arsenic, iron	2, 2
Side Gulches		
RME residential child	Arsenic, iron	3, 1
RME residential child/adult	Arsenic	1
Osburn		
RME residential child	Arsenic	1
Burke/Nine Mile		
RME current/future residential child	Arsenic	1
RME future residential child (groundwater only)	Cadmium, zinc	17, 4
RME future residential child/adult (groundwater only)	Cadmium, zinc	9, 2
Mullan		
RME residential child	Arsenic, iron	1, 1
Homegrown Vegetables		
RME residential child	Cadmium	2
RME residential child/adult	Cadmium	2

Notes:

Individual pathway not combined with hazards from other exposure scenarios or receptors. See text discussion.

See also Figures 5-4 and 5-5.

Table 5-3
Summary of Hazard/Risk Estimates for Combined Child/Adult Residential
and Neighborhood Recreational Scenarios

Total Hazard/Risk		RME Risk Drivers		
RME		Arsenic		Iron
HI	CR	HI (Media)	CR (Media)	HI (Media)
Lower Basin				
2	1E-04	0.7 (Yard soil/soil/sediment)	8E-05 (Yard soil)	0.7 (Yard soil/soil/sediment)
Kingston				
2	8E-05	0.6 (Yard soil/soil/sediment)	6E-05 (Yard soil/soil/sediment)	1 (Yard soil/soil/sediment)
Side Gulches				
4	3E-04	2 (Yard soil/tap water/upland surface soil)	3E-04 (Yard soil/tap water)	0.7 (Yard soil/soil)
Osburn				
1	9E-05	—	7E-05 (Yard soil)	—
Silverton				
1	6E-05	—	4E-05 (Yard soil/upland surface soil/sediment)	—
Wallace				
1	6E-05	—	4E-05 (Yard soil)	—
Mullan				
1	7E-05	—	6E-05 (Yard soil)	—
Burke/Nine Mile				
2	1E-04	1 (Yard soil/waste piles)	1E-04 (Yard soil/tap water/waste piles)	0.4 (Yard soil)

Notes:

Bold value indicates HI exceeds 1 or CR exceeds 1E-06.

— - not a risk driver

CR - cancer risk

HI - hazard index

RME - reasonable maximum exposure

Table 5-4 Summary of RME Hazard/Risk Estimates and Risk Drivers for Modern Subsistence Exposure Scenario

Exposure Medium	Exposure Pathway	Receptor Age Group	Total Hazard / Risk		RME Risk Drivers					
			HI	CR	Arsenic		Cadmium	Iron	Manganese	Mercury
					HI	CR	HI	HI	HI	HI
Fish Bullhead Northern Pike Perch	Ingestion	Adult	1	--	--	--	--	--	--	1
			3	--	--	--	--	--	--	3
			2	--	--	--	--	--	--	2
Water Potato ^a	Ingestion	Child/Adult	0.8	--	--	--	0.8	--	--	--
Surface Soil	Dermal	Child	0.3	--	0.3	--	--	--	--	--
		Child/Adult	0.2	6.E-05	0.1	6.E-05	--	--	--	--
	Ingestion	Child	3	--	0.8	--	--	1	0.6	--
Sediment	Dermal	Child	0.8	--	0.7	--	--	--	--	--
		Child/Adult	0.5	2.E-04	0.4	2.E-04	--	--	--	--
	Ingestion	Child	3	--	0.8	--	--	1	0.7	--
Undisturbed Surface Water	Ingestion	Child	1	--	1	--	--	--	--	--
		Child/Adult	0.7	2.E-04	0.5	2.E-04	--	--	--	--
Disturbed Surface Water	Ingestion	Child	0.3	--	--	--	--	--	--	--
		Child/Adult	0.1	1.E-05	--	1.E-05	--	--	--	--
Total		Adult ^b	3	--	--	--	0.1	--	--	3
		Child	9	--	4	--	0.5	2	2	0.1
		Child/Adult	4	7.E-04	2	7.E-04	1	1	0.5	0.1

^aThe water potato hazard listed in the table is for unpeeled water potatoes. The hazard for peeled water potatoes is 0.5.

^bTotal hazard for the Adult only age group is based on Northern Pike. The species with the highest concentration.

Notes:

Bold value indicates HI exceeds 1 or CR exceeds 1E-06.

-- - Either not calculated or not a risk driver.

CR - cancer risk

HI - hazard index

RME - reasonable maximum exposure

Table 5-5 Summary of RME Hazard/Risk Estimates and Risk Drivers for Traditional Subsistence Exposures

Exposure Medium	Exposure Pathway	Receptor Age Group	Total Hazard/Risk		RME Risk Drivers							
					Antimony	Arsenic		Cadmium	Iron	Manganese	Mercury	
			HI	CR	HI	HI	CR	HI	HI	HI	HI	
Fish Bullhead Northern Pike Perch	Ingestion	Adult	4	--	--	--	--	--	--	--	4	
			10	--	--	--	--	--	--	10		
			7	--	--	--	--	--	--	7		
Water Potato ^a	Ingestion	Child/Adult	4	--	--	--	--	4	--	--	--	
Surface Soil	Dermal	Child	2	--	--	2	--	--	--	--	--	--
		Child/Adult	0.5	2.E-04	--	--	2.E-04	--	--	--	--	--
	Ingestion	Child	17	--	1	5	--	0.6	7	4	--	--
Sediment	Dermal	Child	3	--	--	2	--	--	--	--	--	--
		Child/Adult	2	7.E-04	--	2	7.E-04	--	--	--	--	--
	Ingestion	Child	11	--	0.7	3	--	0.5	4	3	--	--
		Child/Adult	3	4.E-04	--	1	4.E-04	--	1	0.7	--	--
Undisturbed Surface Water	Ingestion	Child	9	--	--	7	--	0.7	--	0.8	0.8	
		Child/Adult	4	1.E-03	--	3	1.E-03	--	--	--	0.4	
Disturbed Surface Water	Ingestion	Child	0.9	--	--	0.3	--	--	--	0.4	--	
		Child/Adult	0.2	4.E-05	--	--	4.E-05	--	--	--	--	
Total		Adult ^b	10	--	--	--	--	0.4	--	--	10	
		Child	43	--	2	19	--	2	11	8	0.8	
		Child/Adult	19	3.E-03	0.5	7	3.E-03	5	3	2	0.4	

^aThe water potato hazard listed in the table is for unpeeled water potatoes. The hazard for peeled water potatoes is 2.

^bTotal hazard for the Adult only age group is based on Northern Pike. The species with the highest concentration.

Notes:

Bold value indicates HI exceeds 1 or CR exceeds 1E-06.

-- - Either not calculated or not a risk driver.

CR - cancer risk

HI - hazard index

RME - reasonable maximum exposure

Table 5-6 Potential Preliminary Remediation Goals for Arsenic

	Residential Soil Ing. and Dermal (child 0- 6) mg/kg	Residential Soil Ing. and Dermal (child/adult) mg/kg	Public Recreational Soil/Sed Ing. and Dermal (child 0-6) mg/kg	Public Recreational Soil/Sed Ing. and Dermal (child/adult) mg/kg	Neighborhood Recreational Waste Pile Ing. And Dermal (child 4-11) mg/kg	Neighborhood Recreational Soil/Sed Ing. And Dermal (child 4-11)- Lower Basin and Kingston mg/kg	Neighborhood Recreational Soil/Sed Ing. And Dermal (child 4-11)- All other areas mg/kg
Arsenic - Cancer (10^{-4} risk)		64		420	1663	815	1016
Arsenic - Cancer (10^{-5} risk)		6		42	166	81	102
Arsenic - Cancer (10^{-6} risk)		1		4	17	8	10
Arsenic - Noncancer	35	123	234	810	748	367	457

Table 5-7 Summary of the Percent of Basin Residences with 95 Percent UCL Arsenic Concentrations Exceeding Selected Potential PRGs

	Total Number of homes sampled for yard soil*	Percent of homes ≥ 35 (mg/kg)	Percent of homes ≥ 64 (mg/kg)	Percent of homes ≥ 123 (mg/kg)
Lower Basin	12	25%	17%	0%
Kingston	28	14%	4%	0%
Side Gulches	31	42%	23%	6%
Osburn	52	44%	21%	15%
Silverton	23	17%	9%	4%
Wallace	36	36%	6%	3%
Nine Mile	34	29%	12%	6%
Mullan	26	23%	15%	4%
CdA Basin	242	31%	14%	6%

* Subsequent residential sampling efforts have taken place since the generation of residential EPCs used in this Baseline HHRA. The total number of homes is based upon the total number of homes sampled in the Basin for which yard soil data is available to date, including these subsequent residential samplings.